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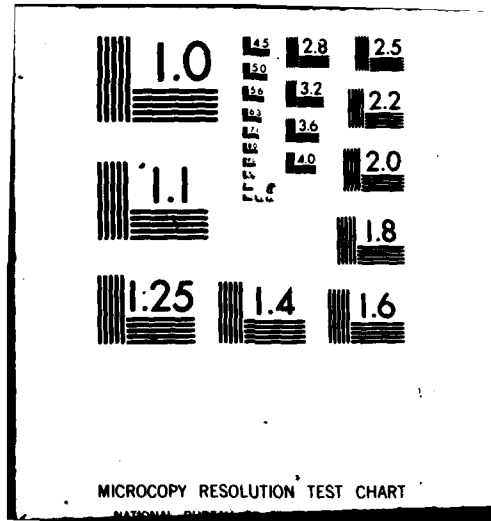   FEB 82 W A ROSENKRANTZ   AFOSR-81-0036

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REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
AFOSR-TR- 82-0256	AD-A113 046	

4. TITLE (and Subtitle)	5. TYPE OF REPORT & PERIOD COVERED
Applications of Functional Analytic and Martingale Methods to Problems in Queueing Network Theory	Final Technical Report 11/1/80 to 12/31/81
	6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)	8. CONTRACT OR GRANT NUMBER(s)
Walter A. Rosenkrantz	AFOSR-81-0036

9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
University of Massachusetts Department of Mathematics & Statistics Amherst, MA 01003	61102F 2304/A5

11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE
Air Force Office of Scientific Research Bolling Air Force Base, DC 20332	February 19, 1982
	13. NUMBER OF PAGES 2

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report)
	Unclassified
	15a. DECLASSIFICATION DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

This report lists the author's

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This final report covers the applications of functional analytic and martingale methods to problems in queueing network theory. The principal investigator lists his publications, lectures, symposia and consulting activities.

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Title: Applications of Functional Analytic and Martingale Methods to
        Problems in Queueing Network Theory -- Final Technical Report
        on Grant #AFOSR 81-0036.

Principal Investigator: Professor Walter A. Rosenkrantz

I. Publications

(1) Limit theorems for Markov processes via a variant of the
     Trotter-Kato theorem (with C.C.Y. Dorea), J. Appl. Prob. 17,
     704-715 (1980).

(2) Some martingales associated with queueing and storage
     processes, Zeit. Wahrsch. verw. Geb., 58, 205-222, 1981.

(3) The Takács integro-differential equation in queueing theory:
     Existence and uniqueness of smooth solutions and related
     questions, AFOSR 81-0036 Technical Report No. 2 -- submitted
     to Annals of Probability and is currently being refereed.

II. In Preparation

(1) Diffusion approximation for a class of Markov processes
     satisfying a nonlinear Fokker-Planck equation. Note:
     This is a joint paper with Li Zhan Bing of Beijing Normal
     of the Peoples Republic of China.

III. Coupling Activites i.e. Lectures, Symposia, etc.

(1) I attended the IEEE international symposium on information
     theory in Santa Monica, CA in February 1981. Consulted with
     Dr. P. Bremaud of the École Nationale Superieure le Techniques
     Avancéses, Paris, France on martingale methods on statistical
     communication theory.

(2) Lectured at UCLA, Department of Mathematics, on February 10,
     1981. Title: Some martingales associated with queueing and
     storage processes.

(3) Lectured at Stanford University, Department of Statistics,
     February 12, 1981. Title: Same as in (2).

(4) I consulted with Professor R. Phillips of the Stanford University
     Mathematics department on some technical details concerning the
     dual semigroup and its applications to the Takács integro-
     differential equations. These discussions were very helpful and
     are so acknowledged in publication (3).

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IV. Consulting

(1) At the request of Professors Jack Wolf and D. Towsley of the
Electircal and Computer Engineering Department here at the
University of Massachusetts, I've begun studying a paper
entitled "Collision-Resolution Algroithms and Random Access
Communications" by James L. Massey, UCLA-Eng-8016 under
Contract (or grant) No. ONR N00014-78-C-0078. Professors
Wolf and Towsley conjecture that Massey's results for the
case of infinitely many identical sources generating Poisson
traffic is the limit (in some suitable sense) of the case
of finitely many sources. These and other problems arising
from this paper are expected to occupy much of my time in
the months ahead.

(2) Professor W. Fleming has, in a private conversation, raised
the question of characterizing the domain of the nonlinear
semi-group arising in optimal control cf. M. Nisio, Publ.
RIMS Kyoto University 13(1976), 513-537. Description of
the domain would be very useful in obtaining regularity
results.

These are two very interesting problems upon which we plan to work
in the months ahead.

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